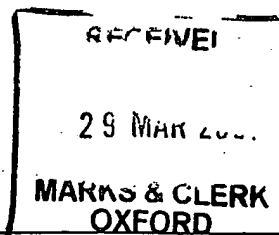


From the  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

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PCT

NOTIFICATION OF TRANSMITTAL OF  
THE INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT  
(PCT Rule 71.1)

Date of mailing  
(day/month/year) 23.03.2001

Applicant's or agent's file reference  
RPH.P51051PC

IMPORTANT NOTIFICATION

International application No.  
PCT/GB99/04365

International filing date (day/month/year)  
22/12/1999

Priority date (day/month/year)  
22/12/1998

Applicant  
WEATHERFORD/LAMB, INC.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

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# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference RPH.P51051PC		FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/GB99/04365	International filing date (day/month/year) 22/12/1999	Priority date (day/month/year) 22/12/1998	
International Patent Classification (IPC) or national classification and IPC E21B43/10			
Applicant WEATHERFORD/LAMB, INC.			
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 7 sheets.</p>			
<p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <li>I <input checked="" type="checkbox"/> Basis of the report</li> <li>II <input type="checkbox"/> Priority</li> <li>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</li> <li>IV <input type="checkbox"/> Lack of unity of invention</li> <li>V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</li> <li>VI <input type="checkbox"/> Certain documents cited</li> <li>VII <input checked="" type="checkbox"/> Certain defects in the international application</li> <li>VIII <input type="checkbox"/> Certain observations on the international application</li> </ul>			
Date of submission of the demand 14/07/2000		Date of completion of this report 23.03.2001	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465		Authorized officer Tompouloglou, C Telephone No. +49 89 2399 2077 	

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/GB99/04365

**I. Basis of the report**

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).)*:

**Description, pages:**

1-19 as originally filed

**Claims, No.:**

1-31 as received on 02/03/2001 with letter of 02/03/2001

**Drawings, sheets:**

1/6-6/6 as originally filed

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/GB99/04365

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes: Claims 1-31
	No: Claims
Inventive step (IS)	Yes: Claims
	No: Claims 1-31
Industrial applicability (IA)	Yes: Claims 1-31
	No: Claims

- 2. Citations and explanations**  
**see separate sheet**

**VII. Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:  
**see separate sheet**

**POINT V**

1. Each of the independent claims 1, 19 solves the same problem of setting a packer as in D1: US-A-3776307 or D2: US-A-5052483 or D3: US-A-2216226 in a different way than in these documents.

Each of:

- D1
- D2
- D3

solves the problem by

- complex setting tool comprising a swage and retainer setting means
- hydraulic pressure
- explosive mechanism, respectively

In the independent claims the problem is solved by an expander functioning according to the principle of "rolling expansion" according to the applicant's own designation. An expander based on this concept is known from D4: US-A-2627891 (see col. 3, l. 39-57) or D5: US-A-2383214 (claims and fig.) both of these documents being well known to the applicant from copending applications in various fields. This concept is of universal application in various technical fields and circumstances as can also be proven from the field of applications of said documents (see D4: col. 1, l. 1-13; D5: 1st par.). Therefore in accordance with Guidelines PCT C IV 8.8 A1) v), claims 1, 19 do not imply an inventive step.

2. The characterising features of the dependent claims have already been employed for the same purpose in a similar method or apparatus, see document D2: col. 4, l. 12-46; fig. 1, 2) or D3 or concern normal rotational friction arrangements. It would be obvious to the person skilled in the art, namely when the same result is to be achieved, to apply these features with corresponding effect to a method or apparatus according to the non inventive independent claims, thereby arriving at then subject-matter of dependent claims 2-18 and 20-31. The subject-matter of said claims does therefore not involve an inventive step (Article 33(3) PCT).

**POINT VII**

Following have not been taken into account:

- Rule 6.3 (b) PCT: correct two part form of independent claims with regard to D1 or D2 or D3.

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/GB99/04365

- Rule 6.2 (b) PCT in combination with Guidelines PCT C III 4.11, third sentence
- Rule 5.1 (a) ii) reference to the documents D1, D2, D3, D4, D5 and  
their disclosure
- Rule 5.1 (a) iii) PCT: description in conformity with the new claims.

CLAIMS

1. A method of providing a downhole seal in a drilled bore between inner tubing and outer tubing, the method comprising: providing an intermediate tubing section defining means for sealingly engaging with the inner tubing; and plastically deforming the intermediate tubing section downhole by rotating an expander member within the tubing section with a tubing engaging portion of the expander in rolling contact with an internal face of the tubing section and producing compressive plastic deformation of the tubing section and a localised reduction in wall thickness resulting in a subsequent increase in diameter and formation of an annular extension, said extension creating a sealing contact with the outer tubing.

2. The method of claim 1, wherein the intermediate tubing section is of metal and deforming the tubing section creates a metal-to-metal seal between the intermediate tubing section and the outer tubing.

3. The method of claim 1 or 2, wherein a seal is provided between the intermediate tubing section and the inner tubing by providing the intermediate tubing section with a

polished bore portion and providing the inner tubing with a corresponding outer wall portion defining sealing bands of elastomer.

4. The method of any of the preceding claims, wherein the outer tubing is elastically deformed to grip the extension.

5. The method of claim 4, wherein the outer tubing is deformed from contact with the extension as the extension is formed.

6. The method of claim 4 or 5, wherein the outer tubing is plastically deformed.

7. The method of any of the preceding claims, wherein the inner tubing is production tubing.

8. The method of any of the preceding claims, wherein the outer tubing is bore-lining casing.

9. The method of any of the preceding claims, wherein the intermediate tubing section is plastically deformed at a plurality of axially spaced locations to form a plurality of annular extensions.



10. The method of any of the preceding claims, wherein relatively ductile material is provided between the intermediate tubing section and the outer tubing.

11. The method of claim 10, wherein the relatively ductile material is provided in the form of a plurality of axially spaced bands, between areas of the intermediate tubing section which are intended to be subject to greatest deformation.

12. The method of any of the preceding claims, wherein relatively hard material is provided between the intermediate tubing section and the outer tubing, such that on deformation of the intermediate tubing section the softer material of one or both of the intermediate tubing section and the outer tubing deforms to accommodate the harder material and thus facilitates in securing the coupling against relative axial or rotational movement.

13. The method of claim 12, wherein the relatively hard material is provided in the form of relatively small elements.

14. The method of any of the preceding claims, further comprising the step of running an expander device into the

bore within the intermediate tubing section and energising the expander device to radially deform at least the intermediate tubing section.

15. The method of claim 14, wherein the device is run into the bore together with the intermediate tubing section.

16. The method of claim 14 or 15, wherein the expander device defines a plurality of circumferentially spaced tubing engaging portions, at least one of which is radially extendable.

17. The method of claim 16, wherein an initial radial extension of said at least one tubing engaging portion, prior to rotation of the device, deforms the tubing section and creates an initial contact between the intermediate tubing section and the outer tubing which is sufficient to hold the tubing section against rotation.

18. The method of any of the preceding claims, wherein at the extension the intermediate tubing section is deformed such that an inner thickness of the tubing section wall is in compression, and an outer thickness of the wall is in tension.

19. Apparatus for use in forming a downhole arrangement for permitting sealing between inner tubing and outer tubing utilising an intermediate tubing section fixed to and in sealing contact with the outer tubing and for sealingly engaging the inner tubing, the apparatus comprising said intermediate tubing section and a body carrying a plurality of circumferentially spaced tubing engaging portions defining rolling surfaces for location within the tubing section, at least one of the tubing engaging portions being radially extendable such that following radial extension of said at least one of the tubing engaging portions the body may be rotated, with the tubing engaging portions in rolling contact with the intermediate tubing section to plastically deform a portion of said section and form an annular extension in the intermediate tubing section for sealing engagement with the outer tubing.

20. The apparatus of claim 19, wherein the apparatus comprises at least three tubing engaging portions.

21. The apparatus of claim 19 or 20, wherein the tubing engaging portions are in the form of radially movable rollers.

22. The apparatus of claim 21, wherein the rollers have tapered ends for cooperating with tapered supports, at least one of the tapered supports being axially movable, such movement inducing radial movement of the rollers.

23. The apparatus of claim 22, wherein each roller defines a circumferential rib, to provide a small area, high pressure contact surface.

24. The apparatus of any of claims 19 to 23, wherein said at least one tubing engaging portion is fluid actuated.

25. The apparatus of claim 24, wherein the tubing engaging portion is coupled to a piston.

26. The apparatus of claim 25, wherein a support for the tubing engaging portion is coupled to a piston via a bearing which permits relative rotational movement therebetween.

27. The apparatus of any of claims 19 to 26 wherein the intermediate tubing section comprises a relatively ductile wall portion including said portion.

28. The apparatus of claim 27, wherein the intermediate tubing section comprises a polished bore portion.

29. The apparatus of any of claims 19 to 28, wherein the intermediate tubing section comprises at least one band of relatively ductile material on an outer face thereof.

30. The apparatus of claim 29, wherein the relatively ductile material is provided in the form of a plurality of axially spaced bands.

31. The apparatus of any of claims 19 to 28, wherein the intermediate tubing section comprises elements of relatively hard material on an outer face thereof.